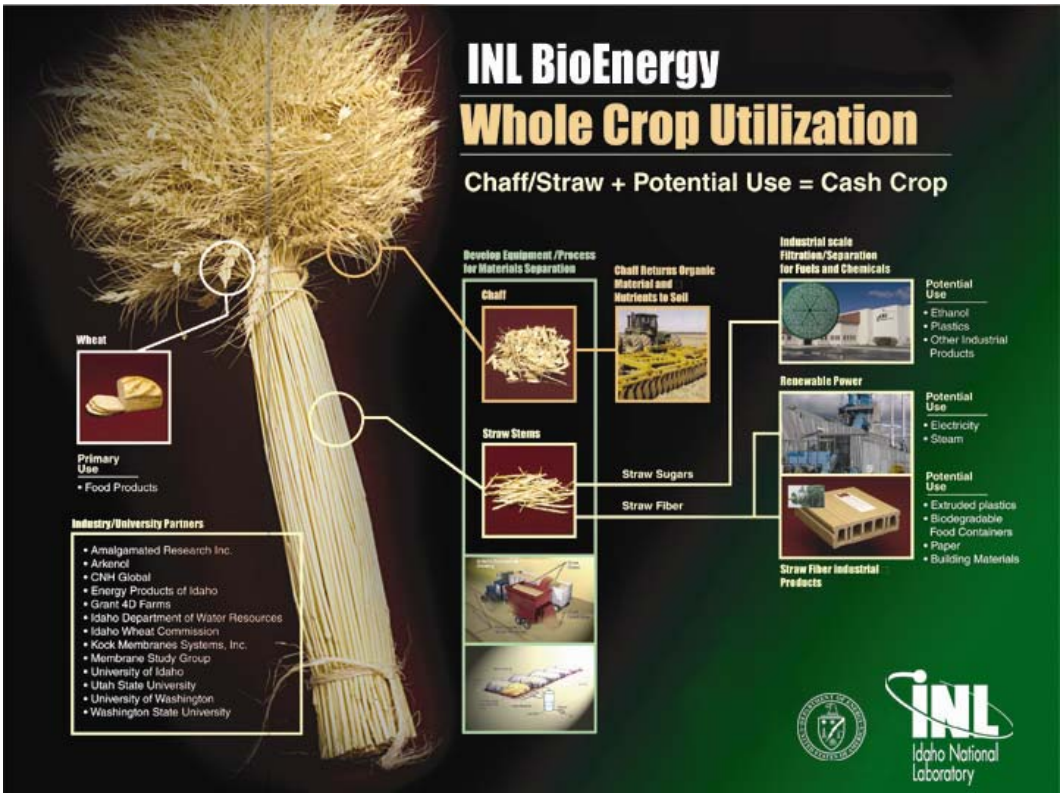
INL's BioEnergy Program

INL's Bioenergy Program is built on the Lab's programmatic ties to DOE's Office of Biomass , its scientific and technical capabilities, resources and infrastructure.



INL's BioEnergy Program draws on the expertise of Biological Sciences and Renewable Energy & Power Departments at the Idaho National Laboratory. The Program conducts biomaterial characterization and computational modeling research to understand and better utilize the physical and chemical properties of diverse biomass sources. The focus is on applying this growing knowledge base to improve feedstock harvesting, fractionation and separation, preprocessing, storage, and pretreatment systems. The goal is to systematically describe and harness biomass physical and chemical characteristics in order to more cost-effectively utilize them for renewable energy and related products.

The Program provides the needed expertise and advanced technology for characterizing diverse biomaterials and biological systems. The identification of chemical, biomechanical, and ultrastructural properties that most impact biomass utilization is possible because of the INL's unique combination of biotechnology, microscopy, computational, and engineering capabilities including single cell microdissection, microarray analysis, bioinformatics, genomics, proteomics, biomechanics, and virtual modeling expertise. These capabilities and INL's state-of-the-art equipment are important resources available to our national laboratory, university, and industrial collaborators for identifying and tailoring biomaterials with improved collection, preprocessing, and pretreating characteristics.

Program Purpose

The Program embraces the vision of 'Whole Crop Utilization' and leverages key multi-disciplinary INL capabilities to address the major science and technology needs associated with the cost-effective utilization of renewable biomass. Whole Crop Utilization means using the entire crop – including both the grain and traditionally discarded plant biomass –

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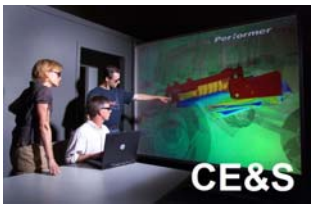

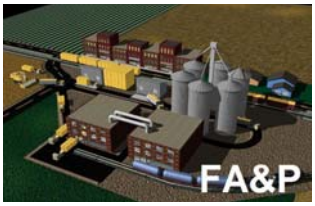

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to produce food, feed, fiber, energy, and value-added products The research focuses on exploiting biomass diversity as it impacts the biomass physical and chemical properties that contribute to material cost and quality throughout the assembly and processing system.

Resources

The Program integrates INL personnel and capabilities with key partners to address national energy and security needs through four signature research areas.

Biomaterials Deconstruction and Composition Laboratory (BD&C) – Utilizes advanced composite theory, microscopy, and NIR analysis to understand and utilize the chemical and mechanical characteristics of biomaterial to enhance harvesting, preprocessing, and pretreatment systems. *(Wright, Pryfogle, Radtke)*

Computational Engineering and Simulation Laboratory (CE&S) – Couples state-of-the-art compositional modeling and simulation tools to allow real-time integration, analysis, and design of biological systems, harvesting and preprocessing equipment, and industry infrastructure and processing interface. *(Kenney, Wright)*

Post-Harvest Physiology and Storage Laboratory (PP&S) – Characterizes the impact of biomaterial genomic diversity and the post-harvest physiology of stored biomass on the biochemical and physical properties of biomass in order to enhance the quality and processablitiy of tailored bioindustry feedstocks. *(Radtke, Pryfogle)*

Feedstock Assembly and Preprocessing Facility (FA&P) – Utilizes advances in laboratory fundamental research to design and implement full scale equipment configurations to demonstrate the capabilities of feedstock assembly and preprocessing systems to meet and potentially exceed feedstock cost, efficiency, and quality targets. *(Hess, Hoskinson, Kenney)*

Goals

The main mission of the Program is to integrate the expertise, advanced technology, and state-of-the-art equipment of its four signature areas to meet DOE Office of Biomass Programs' feedstock interface milestones:

- By 2006, identify sufficient, sustainable ag. residue supply at $10/dry ton grower payment.
- By 2010, resource data with national coverage for all significant existing ag. residue resources is up-to-date, documented, and readily available via the internet.
- By 2010, develop technologies and methods to harvest and collect nationally 300 M tons/year of ag. residues with a 50% cost reduction compared to current (2003) technologies. ($12.50/dry ton)
- By 2009, develop and demonstrate innovative storage methods so that the cost, accounting for losses, is less than 50% compared to current (2003) dry bale based systems. ($1.75/dry ton)
- By 2009, demonstrate transportation cost reductions resulting in average transportation costs of $8/dry ton or less.
- By 2009, demonstrate preprocessing technologies that produce ag. residue resources with bulk, flowable properties similar to large solid commodities so that it can be handled with traditional high-volume conveyance thus reducing cost by 50% when compared to bale-based systems. ($2.75/dry ton)
- By 2007, develop and validate optimized process and cost models for feedstock supply systems showing that ag. residue feedstocks could be supplied to biorefineries at $35/dry ton or less.

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